

REMARKS/ARGUMENTS

Applicant has carefully reviewed the Examiner's Office Action dated January 21, 2009, which rejects Claims 1 to 5 under 35 U.S.C. § 102(b) as being unpatentable over Rangarajan (Thin Solid Films, 419, 2002, p1-4) as evidenced by Soulet (Optimizing, Materials & Gases, Semiconductor Fabtech – 27th Edition) and Smith (7,070,833); rejects Claims 1-5 and 19 under 35 U.S.C. § 103(a) as being unpatentable over Rangarajan as evidenced by Soulet and Smith in view of Buchanan (6,984,591) and Kopacz (6,368,987); rejects Claims 6 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Rangarajan as evidenced by Soulet and Smith in view of Buchanan and Kopacz and further in view of Metzner (2003/0232506); and rejects Claim 20 under 35 U.S.C. § 103(a) as being unpatentable over Rangarajan as evidenced by Soulet and Smith in view of Buchanan and Kopacz and further in view of Johnson (WO02/075801).

In order to clarify features of the claimed invention which are patentable over the references cited in the Office Action and to overcome the rejections based on the references, Applicant has amended Claims 1, 5 and 19.

Regarding the film forming method, Claims 3-4 and 6 have been incorporated into Claim 1, and Claim 7 has been incorporated into Claim 5. Regarding the semiconductor device manufacturing method, independent Claim 19 has been amended to be in accord with amended Claim 1. Newly added Claim 21 depending on Claim 19 is in accord with amended Claim 5. Thus, no new matter has been added.

By way of review, the present invention as defined in Claim 1 relates to a film forming method for forming a hafnium silicate film on a substrate by a CVD process using a gas of HTB and a gas of disilane. The method includes: accommodating the substrate in a process chamber; heating the substrate in the process chamber to a temperature higher than or equal to a temperature at which the HTB is decomposed into hafnium hydroxide and

isobutylene but lower than a self-decomposition temperature of the disilane; and introducing the gas of the HTB and the gas of the disilane into the process chamber through respective introduction passages separated from each other, in a state where one of the introduction passages for introducing the gas of the HTB has a temperature lower than a self-decomposition temperature of the HTB. The temperature of the substrate in the forming the film is higher than or equal to 350 °C but lower than or equal to 450 °C.

Rangarajan describes a process to deposit hafnium silicate film on a substrate by flowing a gas of HTB and a gas of silane into a chamber, while maintaining a temperature of the substrate to be 410 °C. That is, 410 °C in Rangarajan is a temperature for HTB-SiH₄ reaction. Accordingly, though 410 °C falls by accident in a range of the substrate temperature of the present invention, it cannot be considered that Raggarajan suggests a temperature for HTB-Si₂H₆ reaction of the present invention.

In general, a silane/disilane processing temperature is set to be equal to or higher than a self-decomposition temperature thereof in film forming methods using silane/disilane. Smith also describes that silicon hydride gas is heated to a temperature approximately equal to the gas's decomposition temperature (column 3, line 54).

The Office Action asserts that Metzner describes a use of disilane as a silane source in paragraph [0052]. However, Metzner only describes that disilane is used as a source for forming a polycrystalline or amorphous silicon electrode, and never describes a use of disilane as a source for forming a hafnium silicate film.

Neither Soulet, Buchanan, Kopacz or Johnson corrects the deficiencies of Raggarajan, Smith and Metzner pointed out above because neither of these references describes the features of Claims 1 and 19 described above.

Accordingly, it is respectfully submitted that amended Claim 1 cannot be anticipated by Ragarajan, and further, Claims 1 and 19 are not obvious to one of ordinary skill in the art at the time of the invention from the combination of the references cited in the Office Action.

It is respectfully submitted that dependent Claims 5, 20 and 21 are patentable at least for the reasons argued above with regard to the claims from which they depend.

Therefore, Applicant believes that all pending claims are in condition for allowance, and respectfully requests that the present application be allowed.

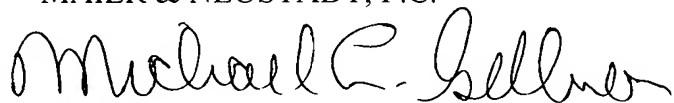
Applicant believes that this is a full and complete response to the Office Action. For the reasons discussed above, applicant now respectfully submits that all of the pending claims are in complete condition for allowance. Accordingly, it is respectfully requested that the Examiner's rejections be withdrawn, and the pending claims be allowed in their present form.

Should the Examiner require or consider it advisable that the specification, claims and/or drawings be further amended or corrected in formal respects, in order to place the case in condition for final allowance, then it is respectfully requested that such amendment or correction be carried out by Examiner's Amendment and the case be passed to issue.

Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing this case to allowance, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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